



# BB1120 Cultivation Technology

## 6.0 credits

### Odlingsteknologi

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

### Establishment

Course syllabus for BB1120 valid from Spring 2012

### Grading scale

A, B, C, D, E, FX, F

### Education cycle

First cycle

### Main field of study

Biotechnology, Technology

### Specific prerequisites

Completed upper secondary education including documented proficiency in English corresponding to English A. For students who received or will receive their final school grades after 31 December 2009, there is an additional entry requirement for mathematics as follows: documented proficiency in mathematics corresponding to Mathematics A. Specific requirements in mathematics, physics and chemistry are corresponding to Mathematics E, Physics B and Chemistry A.

# Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

## Intended learning outcomes

**After completion of the course the student should:**

### **Knowledge and understanding**

- know and describe the principle historical development of bioproducts and bioprocesses and the characteristics of common production organisms
- describe the content of different types of common media
- be able to describe the flux leading to overflow metabolism in *E. coli*, *S. cerevisiae* and animal cells
- understand why and how growth occurs and substrate is consumed in cultivation
- know and describe the common kinetic models for consumption of substrate, maintenance requirements and formation of different products categories
- know and describe common types of bioreactors including the auxiliary equipment. Be able to describe the mixing patterns and the parameters that effects the mixing in those reactors.
- understand how oxygen and carbon dioxide is transported between gas and liquid in bioreactors and the parameters that effect its efficiency
- know, describe and operate the common cultivation techniques used in bioprocessing

### **Skills and abilities**

- be able to calculate the composition of a minimal medium on basis of the components commonly used
- be able to outline and describe simple structured models of the cellular metabolism
- be able to calculate total, volumetric and specific activities and yields in bioprocesses, know the meaning of these concepts and use them to describe the process performance
- be able to derive mass balances for cell, byproduct and product accumulation, substrate and oxygen consumption for different cultivation techniques
- be able to set up Matlab simulations on basis of mass balances and relevant kinetic models
- be able to draw the principal progress of process variables for the cultivation concepts
- be able to plan, operate and evaluate the performance of bioprocesses
- be able to perform oxygen transfer capacity measurements and be able to outline mixing time measurements in bioreactors

### **Ability to judge and to adopt a standpoint**

- be able to speculate on how different environmental conditions affect growth and byproduct formation
- be able to evaluate the reason to why growth ceases in batch cultivation

- be able to discriminate on the use of a specific cultivation concept depending on its benefits and drawbacks in relation to the product and process requirements
- be able to reflect on the effect on process economy with respect to choice of medium, bioreactor and cultivation technique for a specific process and product
- be able to declare how variations in feed, stirring, airflow and cultivation volume affects the cultivation performance

## Course contents

## Course literature

Larsson G, Compendium in Cultivation technology.

## Examination

- LAB1 - Laboratory Work, 1.0 credits, grading scale: P, F
- TEN1 - Examination, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- ÖVN1 - Simulation Task, 1.0 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

## Other requirements for final grade

- Approved simulation exercise
- Participation in 3 workshops
- Participation in study visit
- Approved lab exercise
- Approved examination

## Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.